

**MEMORANDUM**

**DATE:** November 12, 1993

**TO:** Division of Shellfish Sanitation Staff

**FROM:** Robert E. Croonenberghs, Ph.D., Director  
Division of Shellfish Sanitation

**THROUGH:** Eric H. Bartsch, P.E., Director  
Office of Water Programs

**SUBJECT:** Seawater Monitoring Program - Procedure - Marine Biotoxins

**PURPOSE**

The objectives of this policy are to:

1. Provide a procedure for an early warning system.
2. Provide a procedure to define the extent and severity of the occurrence.
3. Provide a procedure for effective State response to minimize illness.
4. Provide a procedure to ensure an adequate investigation, and that information is gathered and evaluated by qualified individuals.
5. Provide a procedure for closing and reopening contaminated areas in accordance with the National Shellfish Sanitation Program Manual of Operations.

**EARLY WARNING SYSTEM**

Gymnodinium breve (Ptychodiscus brevis) blooms originate in the eastern Gulf of Mexico. These blooms are not sudden population explosions but are normal population increases that are confined or physically concentrated by boundary layers, frontal systems, or convection cells sometimes in conjunction with the organisms vertical migratory behavior. In order to have an accumulation of organisms, it is only necessary to have conditions which favor the growth and dominance of a moderately large population of G. breve and the proper hydrographic and meteorological conditions. Blooms are then transported to nearshore waters by currents, tides and wind. Offshore G. breve blooms are sometimes detected as a red to brownish discoloration of surface waters or as massive fish kills.

The states of Florida and North Carolina have experienced significant problems with toxic shellfish poisonings due to G. breve blooms. Both of these states encounter significant Gulf Stream current influence. The influence of the Gulf Stream on Virginia inshore waters is normally insignificant. G. breve has a requirement for high salinity (>24 ppt), and so it is not frequently found in Virginia where the majority of clam and oyster resources exist. The North Carolina shellfish control agency will notify the Division of Shellfish Sanitation in the State of Virginia in the event that they detect significant levels of G. breve in their nearshore waters through their detection and monitoring program. When notified by North Carolina of a toxic bloom event, DSS will evaluate the Gulf stream current patterns as determined by satellite imagery and meteorological events. Predictable transport, nearshore water discoloration, nearshore fish kills or human respiratory irritation will initiate the sampling of the area in question.

In cases of other toxin producing algae the Division will rely upon the Department of Environmental Quality, Marine Resources Commission and other state agencies to alert the Division in the event of a bloom. At this point the bloom event sampling protocol described below will take place in conjunction with Dr. Marshall's lab and the notifying agency.

## **PROCEDURE**

### **Routine Sampling**

Monthly samples will be collected and identified by Dr. Harold Marshall at Old Dominion University and the presence of toxic marine algae reported to the Division of Shellfish Sanitation (DSS) at predetermined sampling stations throughout the bay. ROUTINE MONTHLY SAMPLING WILL BE DONE BY DR. MARSHALL.

### **DSS Sampling Responsibility**

#### **Bloom Event Sampling**

Bloom event sampling will be conducted by DSS personnel in conjunction with Dr Harold Marshall's phytoplankton program at Old Dominion University. During the routine bacteriological water sampling that the DSS performs we will be alert to the presence of algae blooms. Upon discovery of these blooms DSS field personnel will be responsible for collecting samples. SPECIAL SAMPLING OF BLOOM EVENTS OF WHICH THE AGENCY IS AWARE WILL BE DONE BY DSS. If notified by other agencies, the Division will coordinate the collection and examination of the samples. All samples will be collected in prepared 250 ml or 500 ml nalgene bottles containing Lugol's preservative solution. These sample bottles will be carried on all sampling runs. At least five sample bottles will be carried at all times. The bloom should be sampled as follows:

1. In the event of an algal bloom or a fish kill, surface (upper 1 meter) water samples should be taken on site as soon as possible.
2. If the area of the bloom is less than 100 meters in length or width, then one sample shall be taken from the area that appears to have the highest concentration of organisms. This can be estimated by the intensity of water discoloration, i.e. sample from the portion of the bloom where the discoloration is most intense.

3. If the bloom is larger than 100 meters in length or width and it is the only bloom in the area, two samples shall be taken. Again, these samples shall come from the areas with the most intense discoloration.
4. If there are multiple blooms in the area of sampling, take one sample from a bloom in the approximate middle of the area containing the blooms and four from the blooms at equal distances along the perimeter of the area. Again sample the area within each of the five sample areas that has the most intense discoloration.
5. The samples should be tightly sealed and brought back to the field office. The field staff shall make arrangements in conjunction with the field director to have these samples transported to Dr. Marshall's laboratory at Old Dominion University so that they arrive within 48 hours of the time they were taken.
6. As soon as is feasible, Dr. Marshall will report the results to the central office, who will in turn relay this information immediately to the field office.
7. The following protocol for sample preparation has been provided by Dr. Marshal:

#### SAMPLING DURING ALGAL BLOOMS

- a. Any well rinsed plastic or glass container can be used. A 500 ml sample is adequate. If you have Lugol's preservative, add about 4 ml/500 ml sample, i.e. 2 ml per 250 ml bottle. No refrigeration of sample is necessary. The sample may be taken with a collection bucket, water sampler, or directly from the water.

- b. Be sure to record on the bottle label the date, time, location, plus the water temperature and salinity if possible.
  - c. The water sample should be delivered to:  
H. G. Marshall, Mills Godwin Life Science Bldg., Room  
114, at Old Dominion University.  
  
The mailing address is:  
  
H. G. Marshall, Department of Biological Sciences  
Old Dominion University, Norfolk, VA 23529-0266.
  - d. In the event of a fish kill or an extensive bloom, please notify the Phytoplankton Laboratory at Old Dominion University at 804-683-4994, or leave a message for H. Marshall with the departmental secretary at 804-683-3595.
8. Most algal blooms in Virginia's tidal waters will be caused by dinoflagellates. The vast majority of these are nontoxin producing species, with associated fish kills caused by reduced oxygen conditions.

However, there are also a few toxin producing dinoflagellates in Virginia tidal waters, and these may also produce fish kills.

Recently, a dinoflagellate (Pfiesteria piscimorte) called the phantom dinoflagellate, has been associated with major fish kills in the Neuse and Pamlico estuaries in North Carolina. During the summer of 1992, this species was also reported from Jenkins Creek on the Choptank River in Maryland. There is special concern about the species because it produces large fish kills and its dynamic life cycle makes it difficult to associate with the kill since it quickly settles in the substrate. When this dinoflagellate produces a fish kill, the fish are known to appear disoriented and move suddenly or erratically. They may also have lesions on the body, especially near the mouth. The waters are also noticeably discolored.

If you suspect a P. piscimorte bloom, special care should be taken in taking water samples and to avoid contact with sensitive parts of the body. Unpreserved water should not be brought to other waters, or locations. Also, if you suspect this kind of fish kill, with these conditions, be sure to take water samples and inform the ODU Phytoplankton Laboratory as soon as possible.

### **Defining Severity and Extent of Bloom Events**

When elevated concentrations (>1000 cells/liter) of G. breve are found, the initial bloom event sampling program shall be continued and expanded. In conjunction with Dr. Marshall at the ODU phytoplankton laboratory, sampling shall be conducted at predetermined stations in order to monitor the increase or decrease in cell concentrations. Sampling results, field reports, and hydrographic and meteorological data shall be evaluated by the classification chief to determine the severity and extent of a toxic algae bloom. If other toxic algae bloom occur, the Division will consult with Dr. Harold Marshall, ODU, and Dr. Sherwood Hall, FDA, to determine an appropriate course of action.

### **Restricting Harvesting**

When G. breve cell concentrations equal or exceed 5,000 cells/liter in the creeks, bays, estuaries, or inlets, the adjacent estuarine shellfish harvesting areas shall be temporarily closed to harvesting. Evaluation of hydrographic and meteorological factors and water samples shall be used to determine the distribution of a bloom. If it is determined that additional shellfish harvesting areas will be impacted, those waters shall be temporarily closed. If other toxic algae bloom occur, the Division will consult with Dr. Harold Marshall, ODU, and Dr. Sherwood Hall, FDA, to determine an appropriate course of action.

### **Disposition of Product Harvested from Toxic Algae Bloom Areas**

With an early warning system that includes timely and representative sampling, and prompt shellfish harvesting area closures, the harvest and distribution of potentially contaminated shellfish is unlikely. However, the Division of Shellfish Sanitation has the authority to examine shellfish records and requires all certified shellfish dealers to maintain adequate records in order to determine the distribution of potentially contaminated product and shall recall or embargo any such product.

### **Reopening of Harvest Areas Closed Due to Toxic Algae Blooms**

Following area closure, water samples are collected at key, representative sampling stations, and G. breve cell counts determined. Once cell counts return to background levels, shellfish will be gathered for toxicity analysis. Shellfish shall be collected for toxicity analysis at sampling stations where shellfish are most likely to have been impacted. Areas closed to harvesting because of presence of G. breve shall not be reopened until counts are below 5,000 cells per liter inshore and offshore of the affected shellfish harvesting area, and shellfish meats have been shown to be free of toxin by laboratory analysis. If other toxic algae bloom occur, the Division will consult with Dr. Harold Marshall, ODU and Dr. Sherwood Hall, FDA to determine an appropriate course of action.

**Procedures to Disseminate Information Concerning Toxic Algae Blooms**

An important component in preventing shellfish poisoning is notifying the public and the industry of the danger associated with the harvesting and consumption of molluscan shellfish from areas where toxic algae blooms have occurred. Additionally, local health departments and health agencies in other states may need to be notified if potentially contaminated product makes its way into the distribution system. The Division shall notify these agencies as follows:

Industry - Direct notification of harvesters within affected areas by the Virginia Marine Resources Commission and processors by the Division of Shellfish Sanitation.

Local Health Department and other Health Agencies - Direct notification and written notification.

Public - Department of Health Public Information Officer will notify and educate the media and the public.